REMARKS

Claims 1-7 are pending. By this Preliminary Amendment, the specification is amended for editorial reasons. No new matter has been added. Prompt and favorable examination on the merits is respectfully solicited.

Respectfully submitted,

James A. Oliff
Registration No. 27,075

Joel S. Armstrong
Registration No. 36,430

JAO:JSA/slm

Date: February 6, 2002

OLIFF & BERRIDGE, PLC
P.O. Box 19928
Alexandria, Virginia 22320
Telephone: (703) 836-6400

DEPOSIT ACCOUNT USE AUTHORIZATION
Please grant any extension necessary for entry;
Charge any fee due to our Deposit Account No. 15-0461

APPENDIX

Changes to Specification:

Page 6, between lines 6 and 7, a new paragraph is added.

Page 6, lines 13-28:

In the second aspect of the invention, the above-mentioned iron-based mixed powder is a mixture of the iron-based powder and a lubricant (lubricant for compacted powder), or is a mixture further comprising a powder for alloying. The content of the lubricant for compacting powder (means additive amount hereinafter) is preferably 0.05 to 0.40% by weight relative to the entire iron-based mixed powder. In the second aspect of the invention, the lubricant for compacting powder is preferably at least one kind of lubricant having a melting point higher than a predetermined temperature of the compaction pressure, or more preferably, is a mixed lubricant including a lubricant having a low melting point equivalent to, or lower than, the predetermined temperature of the compaction pressure and a lubricant having a melting point higher than the predetermined temperature of the pressure molding. In this case, the content of the above-mentioned lubricant having a low melting point equivalent to, or lower than, the predetermined temperature of the compaction pressure is preferably 10 to 75% by weight relative to the entirety of the contained lubricant for compacting powder, and the content of the lubricant having a melting point higher than the predetermined temperature of the pressure molding is preferably the balance of 25 to 90% by weight.

Page 8, line 25 - page 9, line 7:

Because the lubricant for die lubrication has a melting point higher than the predetermined temperature of the compaction pressure, the lubricant is not fused and is present as a solid powder on the surface of the die so that the function of lubricating on the surface of the die is maintained, the density of the compact is increased, and the ejection

force is not ~~decreased~~increased. On the other hand, when the lubricant for die lubrication has a melting point lower than the predetermined temperature of the compaction pressure, the lubricant fuses on the surface of the die and spreads in a liquid state. This is advantageous from the viewpoint of uniform adhesion, although there are problems in that the lubricant flows out of the surface of the die, or even if the lubricant does not flow out, the lubricant may be suctioned into the powder by a capillary phenomenon during the compaction of the iron-based mixed powder so that the lubricant remaining on the surface of the die may be decreased. Accompanying this, the function of lubricating on the surface of the die may be reduced and the ejection force may be increased.

Page 9, between lines 18 and 19, a new paragraph is added.

Page 15, lines 16-23:

As an iron-based powder, a partially alloyed steel powder having a composition of Fe-4Ni-0.5Mo-1.5Cu was used. This partially alloyed steel powder was mixed with a graphite powder and lubricants for powder molding by a heat mixing method using a high-speed mixer so as to produce an iron-based mixed powder. The additive amount of the graphite was 0.5% by weight relative to the entire iron-based mixed powder. The kinds and the additive amounts relative to the entire iron-based mixed powder of the lubricants for compacting powder were as shown in Tables 1-1 to 1-3 below. *(basis for amendment in page 6)

Page 17, lines 3-5:

The resulting compacts were cut at their centers, embedded in a resin and polished. Thereafter, the presence or absence of a coarse cavity in the cross section was observed with an optical microscope.

Page 18, Table 1-1:

Compact No.	Lubricant for Die Lubrication				Lubricant for Powder Molding in Iron-Based Mixed Powder				
	Lubricant Having Melting Point Higher Than Temperature of Pressure Molding		Lubricant Having Low Melting Point Equivalent to or Lower Than Temperature of Pressure Molding		Lubricant Content** % by weight	Lubricant Having Melting Point Higher Than Temperature of Pressure Molding		Lubricant Having Low Melting Point Equivalent to or Lower Than Temperature of Pressure Molding	
	Content* % by weight	Kind (Melting Point)	Content* % by weight	Kind (Melting Point)		Kind (Melting Point) : Content % by weight***	Content* % by weight	Kind (Melting Point) : Content % by weight***	Content* % by weight
1	50 50	A1(150°C) A3(230°C)	-	-	0.4	C1(148°C):0.4	100	-	-
2	25 75	A1(150°C) A4(216°C)	-	-	0.3	C1(148°C):0.3	100	-	-
3	25 75	A4(216°C) H1(327°C)	-	-	0.3	J1(about 140°C):0.3	100	-	-
4	50 50	G1(160°C) C1(148°C)	-	-	0.05	C1(148°C):0.05	100	-	-
5	50 50	A3(230°C) D2(260°C)	-	-	0.1	C1(148°C):0.1	100	-	-
6	25 75	A4(216°C) B1(144°C)	-	-	0.2	C1(148°C):0.2	100	-	-
7	80 20	A3(230°C) E1(153°C)	-	-	0.3	J2(about 135°C):0.3	100	-	-
8	50 50	A3(230°C) F1(155°C)	-	-	0.3	J3(about 149°C):0.3	100	-	-
9	30 70	C1(148°C) C2(215°C)	-	-	0.2	C1(148°C):0.2	100	-	-
10	25 75	C1(148°C) C3(255°C)	-	-	0.25	C1(148°C):0.25	100	-	-
11	25 75	C2(215°C) C3(255°C)	-	-	0.25	J4(about 118°C):~~0.4~~0.125 A2(127°C):~~0.4~~ 0.125	50 50	-	-
12	25 75	G1(160°C) A3(230°C)	-	-	0.20	J5(about 125°C):~~0.4~~0.1 J4(about 118°C):~~0.1~~0.025 C1(148°C):~~0.3~~ 0.075	50 12.5 37.5	-	-

Page 20, Table 1-2:

Compact No.	Lubricant for Die Lubrication				Lubricant for Powder Molding in Iron-Based Mixed Powder				
	Lubricant Having Melting Point Higher Than Temperature of Pressure Molding		Lubricant Having Low Melting Point Equivalent to or Lower Than Temperature of Pressure Molding		Lubricant Content** % by weight	Lubricant Having Melting Point Higher Than Temperature of Pressure Molding		Lubricant Having Low Melting Point Equivalent to or Lower Than Temperature of Pressure Molding	
	Content* % by weight	Kind (Melting Point)	Content* % by weight	Kind (Melting Point)		Kind (Melting Point) : Content % by weight***	Content* % by weight	Kind (Melting Point) : Content % by weight***	Content* % by weight
13	30 70	C2(215°C) C3(255°C)	-	-	0.3	A4(216°C):0.3	100	-	-
14	25 25 50	C1(148°C) C2(215°C) C3(255°C)	-	-	0.2	C2(215°C):0.1 C3(255°C):0.1	50 50	-	-
15	25 75	C1(148°C) D1(220°C)	-	-	0.4	A3(230°C):0.3	75	A2(127°C):0.1	25
16	70 30	C2(220°C) B1(144°C)	-	-	0.05	E1(152°C):0.05	100	-	-
17	70 30	C2(220°C) E1(153°C)	-	-	0.2	C1(148°C):0.2	100	-	-
18	25 75	C1(148°C) I3(not fused)	-	-	0.4	C1(148°C):0.4	100	-	-
19	50 50	D1(220°C) D2(260°C)	-	-	0.2	C1(148°C):0.2	100	-	-
20	70 30	D2(260°C) D3(215°C)	-	-	0.1	F1(155°C):0.1	100	-	-
21	60 40	D3(215°C) E1(153°C)	-	-	0.4	C3(255°C):0.2	50	A2(127°C):0.1 C1(148°C):0.1	25 25
22	55 45	D3(215°C) B1(144°C)	-	-	0.35	C1(148°C):~~0.2~~0.175 A1(150°C):~~0.1~~0.088	50 25	A2(127°C):~~0.1~~ 0.088	25

Page 22, Table 1-3:

Compact No.	Lubricant for Die Lubrication				Lubricant for Powder Molding in Iron-Based Mixed Powder			
	Lubricant Having Melting Point Higher Than Temperature of Pressure Molding		Lubricant Having Low Melting Point Equivalent to or Lower Than Temperature of Pressure Molding		Lubricant Content** % by weight	Lubricant Having Melting Point Higher Than Temperature of Pressure Molding		Lubricant Having Low Melting Point Equivalent to or Lower Than Temperature of Pressure Molding	
	Content* % by weight	Kind (Melting Point)	Content* % by weight	Kind (Melting Point)		Kind (Melting Point): Content % by weight***	Content* % by weight	Kind (Melting Point) : Content % by weight***	Content* % by weight
23	60 40	D3(215°C) F2(178°C)	-	-	0.25	A1(150°C):0.25	100	-	-
24	50 50	B1(144°C) E1(153°C)	-	-	0.2	D1(255°C):0.2	100	-	-
25	50 50	B1(144°C) I1(not fused)	-	-	0.4	D2(268°C):0.4	100	-	-
26	30 70	E1(153°C) I2(not fused)	-	-	0.05	D3(215°C):0.05	100	-	-
27	30 30 40	A3(230°C) C1(148°C) B1(144°C)	-	-	0.20	C1(148°C):0.20	100	-	-
28	-	-	-	-	0.4	C1(148°C):0.4	100	-	-
29	50	C3(255°C)	50	A2(127° C)	0.4	C1(148°C):0.4	100	-	-
30	100	C3(255°C)	-	-	0.4	C1(148°C):0.4	100	-	-
31	-	-	100	A2(127° C)	0.4	C1(148°C):0.4	100	-	-
32	-	-	-	-	0.25	J4(about 118°C):~~0.4~~0.125 A2(127°C):~~0.4~~ 0.125	50 50	-	-
33	100	A2(127°C)	-	-	0.25	J5(about 125°C):~~0.4~~0.125 J4(about 118°C):~~0.1~~0.031 C1(148°C):~~0.3~~ 0.094	50 12.5 37.5	-	-

Page 23, Table 1-3:

Pressure Molding Condition			Compact				Remark
Die Preheating Temperature (°C)	Heating Temperature of Iron-Based Mixed Powder (°C)	Temperature of Pressure Molding (°C)	Ejection Force (MPa)	Density (Mg/m^3)	Appearance	Sectional Microstructure	
150	130	130	16	7.42	Good	Good	Invention
150	130	130	16	7.42	Good	Good	Invention
150	130	130	14	7.40	Good	Good	Invention
150	130	130	17	7.46	Good	Good	Invention
150	130	130	16	7.43	Good	Good	Invention
150	130	130	35	7.31	Flaw	Coarse Cavity	Conventional Example
150	130	130	28	7.35	Good	Good	Comparative Example
150	130	130	25	7.33	Good	Good	Comparative Example
150	130	130	31	7.3	Good	Good	Comparative Example
25	25	25	35	7.20	Flaw	Coarse Cavity	Conventional Example
25	25	25	36	7.25	Flaw	Good	Comparative Example

*) Content relative to the entirety of lubricants
**) Total content of lubricants in the iron-based mixed powder
***) Content in the iron-based mixed powder
Reference numerals designating kinds of lubricants correspond to reference numerals as shown in Table 2

Page 25, lines 1-6:

Regarding each of the compacts according to the invention, the ejection forces after molding was as low as about 20 MPa or less, and the density was as high as about 7.30 Mg/m^3 or more in the ordinary temperature molding and was about 7.40 Mg/m^3 or more in the warm molding. In the compacts, defects such as flaws and fractures were not observed. The properties of sectional microstructure of the compact were normal, and no coarse cavities were observed. *(basis for amendment)

Page 25, lines 11-16:

Regarding the Comparative Examples outside of the scope of the invention, the ejection forces were as high as more than 20 MPa, the densities in the ordinary temperature molding were as low as 7.25 Mg/m^3 or less, the densities in the warm molding were as low as 7.35 Mg/m^3 or less, flaws were observed on the surfaces of the compacts, or coarse cavities were observed in the vicinity of the surfaces of the cross sections of the compacts. *(basis for amendment)